CLAIMS:

We claim the following:

1. A process of making a small quantity of diluted ammonia and air mixture from natural gas for use in power plant NOx abatement using SCR or SNCR, comprising the following steps:
    a) Introducing a mixture of pre-conditioned hydrogen and nitrogen to a series of ammonia synthesis reactor made of a series of pipe sections wherein the said mixture is partially converted to ammonia. The reactor design will use conventional piping similar to that used in power plant superheated steam lines. Due to the low catalyst space velocity for the mini plant, the reactor pressure is reduced substantially from the current practice of 4000 psig or higher to about 2500 psig for the current design.
    b) The liquid ammonia is vaporized and conditioned to facilitate its use in SCR. Ammonia conditioning includes gas heating or dilution with air to meet SCR feed gas requirements. This conditioning step eliminates certain equipment required in a conventional ammonia supply system for SCR. Unheated ammonia vapor can also be made for use in industrial applications.
    c) All purge gas streams are combined into the product gas, so no emission point exists in the system.
2. An auto-refrigeration scheme that uses one of the following pressure expansion devices:
    a) The use of a Joule-Thompson (J-T) expansion valve to generate refrigeration. Refrigeration is produce by pressure reduction of ammonia liquid from high pressure (example: from 2000 psig to less than 100 psig). Refrigeration is needed to fully condense the ammonia vapor in the ammonia synthesis reactor effluent gas stream. Unlike a conventional ammonia plant where an ammonia compressor is used to create refrigeration, this process requires no ammonia compressor.

b) The use of a capillary tube or orifice as the pressure reduction and gas expansion device in lieu of the above mentioned J-T valve.

3. An SCR ammonia supply conditioning system comprising two possible heat recovery schemes:
    a) Recover waste heat from the synthesis reactor effluent to heat the dilution air supply. This scheme saves energy in the SCR system since the dilution air must be heated either by electricity or by steam in the current commercial practices that use aqueous ammonia or urea hydrolysis.
    b) Recover synthesis reactor heat to heat the product ammonia gas to 300 °C or higher. If the distance between the ammonia skid and SCR ammonia feed point is long, it is more economical to transport highly concentrated hot ammonia gas than the 5% diluted ammonia gas.